

SUPPORT FOR THE AMENDMENTS

This Amendment amends Claim 1; and adds new Claim 9. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 1 is found in the specification at least at page 5, lines 6-16; and page 15, lines 1-2. Support for Claim 9 is found in Claim 1 and in the specification at least at page 16, Table 2, No. 9. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-9 will be pending in this application. Claim 1 is independent. Claims 6-8 are withdrawn from consideration.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the October 4, 2005, personal interview.

As discussed at the personal interview, although conventional steel sheets combine high strength and excellent formability, conventional steel sheets having high strength are lacking in bendability. See, e.g., specification at page 1, lines 15-16; page 1, line 26 to page 2, line 1; page 2, line 14 to page 3, line 1.

The present invention provides a steel sheet combining high strength and excellent bendability. This combination of properties is achieved by the present invention using a specific two-stage heat treatment to control the number of carbide grains to no more than 40 per 2000 μm^2 between retained austenite and ferrite in the steel sheet. See, e.g., specification at page 1, lines 4-6; page 4, line 16 to page 5, line 12; page 6, line 11 to page 8, line 4.

Claims 1 and 3-5 are rejected under 35 U.S.C. § 102(b) over Japanese Patent 2000319759 ("JP-759") or Japanese Patent 2000309853 ("JP-853"). Claim 2 is rejected

under 35 U.S.C. § 103(a) over JP-759 or JP-853 and further in view of Table 1.1 of ASM publication ("ASM"). Claims 1 and 4-5 are rejected under 35 U.S.C. § 102(b) over European patent 1201780 ("EP-780"). Claims 2 and 3 are rejected under 35 U.S.C. § 103(a) over EP-780 in view of Table 1.1 of ASM publication ("ASM").

JP-759 discloses a steel tube excellent in workability by a bending roll system. The steel tube contains 0.05 to 0.25 wt% C, 0.5 to 2.5 wt% Si, 0.5 to 3.0 wt% Mn, ≤ 0.005 wt% S, ≤ 0.15 wt% P; 0.005 to 0.10 wt% Al, containing at need 0.0002 to 0.0020 wt% Ca, with a balance of iron with inevitable impurities. The steel tube has a composite structure composed of 5 to 15% of austenite metastable at ordinary temperatures, with a balance of martensite, bainite and ferrite. JP-759 at English-language abstract.

JP-853 discloses a steel tube excellent in workability. The steel tube consists of 0.05 to 0.20 wt% C, 0.5 to 2.0 wt% Si, 0.5 to 2.5 wt% Mn, ≤ 0.005 wt% S, ≤ 0.15 wt% P; 0.005 to 0.10 wt% Al, with a balance of iron with inevitable impurities and containing, if necessary, 0.0002 to 0.0020 wt% Ca. The steel tube has a structure consisting of $\geq 5\%$ austenite metastable at ordinary temperatures and a balance of martensite, bainite and ferrite. JP-853 at abstract.

EP-780 discloses a steel plate have excelling burring workability and fatigue strength. The steel plate contains 0.01 to 0.3 mass% C, 0.01 to 2 mass% Si, 0.05 to 3 mass% Mn, 0.1 mass% or less of P, 0.01 mass% or less of S and 0.005 to 1 mass% of Al. The steel has a microstructure having ferrite as the main phase and martensite or retained austenite mainly as the second phase. EP-780 at abstract. The second phase may also contain bainite and pearlite. EP-780 at [0026].

ASM is cited for disclosing that Mo, Ni, Cu, Ca and/or REM are additives in steel sheets. Final Rejection at page 4, section 10 and 14.

However, the cited prior art is silent about carbide grains. The Office Action admits that JP-759, JP-853 and EP-780 each has no disclosure with regards to carbides. Office Action at page 3, section 7, line 1; page 4, section 12, lines 3-4. Furthermore, each of JP-759, JP-853 and EP-780 is silent about the location of any carbide grains that might appear in their respective alloys. Thus, each of JP-759, JP-853 and EP-780 fails to suggest the independent Claim 12 limitation that "there exist no more than 40 carbide grains per $2000 \mu\text{m}^2$ in the steel sheet ***between the retained austenite and the ferrite***".

This feature is not inherent in the cited prior art. Conventional steel sheets undergo a heat treatment that causes the C concentration to vary greatly from the inside to the outside of retained austenite in the sheets. This gives rise to carbide grains that degrade sheet bendability. The conventional heat treatment involves (i) heating to a temperature higher than the A_1 point and lower than the A_3 point for about 60-180 seconds, followed by (ii) cooling to a temperature in the zone for bainite transformation (e.g., about $400\pm 50^\circ\text{C}$) for about 300 seconds so as to stabilize the gamma phase with an increased C concentration therein and to ensure a prescribed amount of retained austenite. Specification at page 6, lines 11-24.

In contrast, in the two-stage heat treatment of the present invention between (i) and (ii) is a step (iii) of cooling to $700\pm^\circ\text{C}$ and maintaining this temperature for 10-30 seconds. The two-stage heat treatment reduces the difference in C concentration between the inside and outside of the retained gamma phase and suppresses formation of carbide between retained austenite and ferrite. Specification at page 6, line 25 to page 7, line 21; page 12, lines 5-7.

JP-759, JP-853 and EP-780 are each silent about the step (iii) of the present invention (cooling to $700\pm^\circ\text{C}$ and maintaining this temperature for 10-30 seconds), which controls the amount of carbide grains between retained austenite and ferrite. See, e.g., EP-780 at [0060]-

[0064]. The silence in JP-759, JP-853 and EP-780 about carbide grains, coupled with the silence in these references regarding step (iii) of the present invention which suppresses the formation of carbide grains, indicates that the independent Claim 1 limitation that "there exist no more than 40 carbide grains per $2000 \mu\text{m}^2$ in the steel sheet between the retained austenite and the ferrite" is not inherent in JP-759, JP-853 and EP-780.

Any *prima facie* case of obviousness based on the cited prior art is rebutted by the significant improvement in the combination of high strength and excellent bendability that is achieved in accordance with the present invention over independent Claim 1's critical range of "no more than 40 carbide grains per $2000 \mu\text{m}^2$ ". See executed Declaration under 37 C.F.R. § 1.132 filed May 25, 2005. JP-759, JP-853 and EP-780, which are directed to steels having workability (and fatigue strength for EP-780), fail to suggest the combination of high strength and excellent bendability that is achieved by the present invention. As a result, any *prima facie* case of obviousness based on the cited prior art is rebutted.

Because the cited prior art fails to suggest the independent Claim 1 limitation that "there exist no more than 40 carbide grains per $2000 \mu\text{m}^2$ in the steel sheet between the retained austenite and the ferrite", and any *prima facie* case of obviousness based on the cited prior art is rebutted, the prior art rejections should be withdrawn.

New Claim 9 is further patentably distinguishable over the cited prior art because each of JP-759, JP-853 and EP-780 fails to suggest the Claim 9 limitation that "there exist 9 to 40 carbide grains per $2000 \mu\text{m}^2$ in the steel sheet between the retained austenite and the ferrite".

Applicants respectfully traverse the Office Action assertion at page 2, section 1, that product Claim 6 (which recites "The steel sheet as defined in Claim 1, wherein ...") is independent or distinct from the invention originally claimed in product Claim 1 simply because Claim 6 includes process limitations. Applicants respectfully request rejoinder of Claim 6.

Pursuant to M.P.E.P. 821.04, after independent product Claim 1 is allowed, Applicants respectfully request examination and allowance of withdrawn Claims 6-8, which include all of the limitations of product Claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon



Corwin P. Umbach, Ph.D.
Registration No. 40,211

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 06/04)

NFO:CPU